



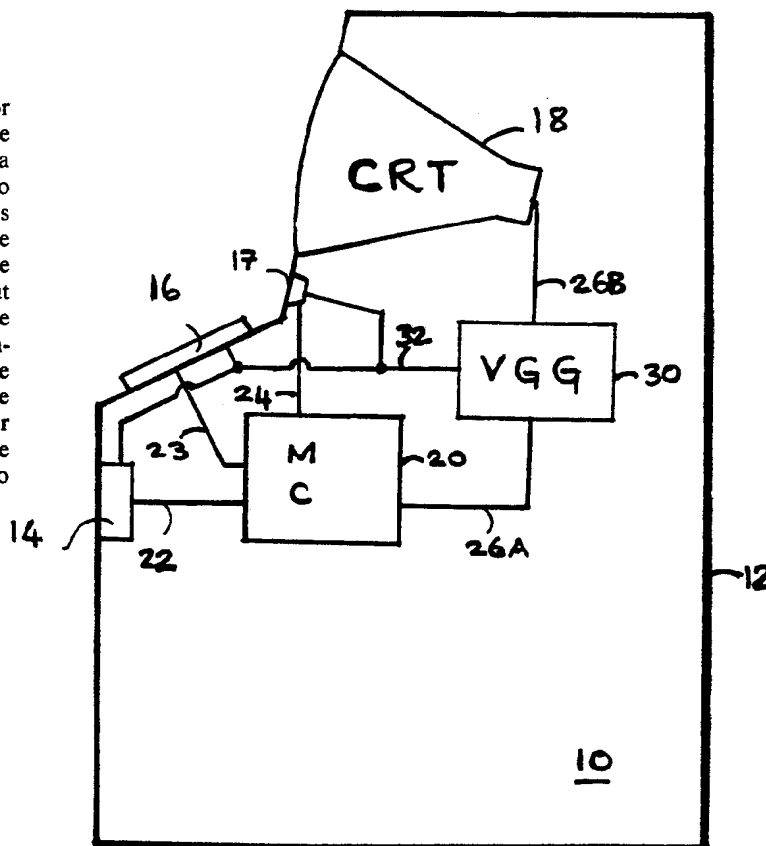
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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## (54) Title: DISPLAY OF PICTURES DURING THE INACTIVE MODE OF AN ARCADE GAME

## (57) Abstract

A video graphics generator is provided for a video system such as an amusement machine which is operable in a first, inactive, mode and a second, active, mode and which includes a video display device, user operable activation means and a machine controller operable in both the first mode and, in response to activation of the activation means, in the second mode to output video signals for driving the display device. The video graphics generator comprises programmable means responsive to operation of the video system in the first mode to interrupt the video signals output by the machine controller for a predetermined interval and to substitute alternative video signals for display on the video display device during the interval.



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## DISPLAY OF PICTURES DURING THE INACTIVE MODE OF AN ARCADE GAME

This invention relates to a video graphics generator suitable for use with a video system which is operable in a first, inactive, mode and a second, active, mode and which includes a video display device, user operable activation means and a machine controller operable in both the first mode and, in response to activation of the activation means, in the second mode to output video signals for driving the display device.

Video systems such as amusement machines video arcade games normally have two modes of operation. In one mode of operation the amusement machine is operable to play a game on payment of an appropriate amount by a user. The amusement machine is normally provided with a number of switches, levers, joysticks, track balls and the like to enable a user to interact with the machine. Activation of this, play, mode is normally in response to the user inserting money or tokens into a coin or token mechanism. The play mode continues until the game has finished and/or the playtime bought by the user has run out. On termination of the play mode, the amusement machine will revert to a default, or attract, mode. In the attract mode, the amusement machine normally displays pictures which will attract the user to use the machine: hence the term 'attract' mode. Typically, an amusement machine spends most of its time in the attract mode waiting for a customer.

A modern amusement machine, such as a video arcade game, is an expensive piece of equipment and it is undesirable that such a piece of equipment should spend a large percentage of its time not earning money for its owner and operator. An object of the present invention is, therefore, to address this problem.

In accordance with a first aspect of the present invention, there is provided a video graphics generator for a video system which is operable in a first, inactive, mode and a second, active, mode and which includes a video display device, user operable activation means and a machine controller operable in both the first mode and, in response to activation of the activation means, in the second mode to output video signals for driving the display device, the video graphics generator comprising programmable means responsive to operation of the video system in the first mode to interrupt the video signals output by

the machine controller for a predetermined interval and to substitute alternative video signals for display on the video display device during the interval.

Although the invention could be used on many different video systems, such as sports ground score boards, bowling alley scoring systems and the like, it is particularly suitable for use in an amusement machine having an attract mode, a play mode and a play selection means.

The video graphics generator is preferably provided as an add-on unit for an existing video system. In use on an amusement machine, it enables the usual attract mode of such an amusement machine to be interrupted to permit the display of alternative video signals to those normally produced during the attract mode. These alternative video signals can be video signals forming one or more screens of one or more advertisements for products and/or services with the result that it is possible for the owner and/or operator of the machine to get royalties for the display of those advertisements.

Preferably, the programmable means comprises a solid state memory means for the storage of a plurality of screens of video graphics data and control logic for selecting a screen of video graphics data from storage for generating the alternative video signals for display. A screen of video graphics data can provide a powerful advertising medium.

Preferably, the solid state memory means comprises one or more E-PROM type memories such as, for example, "flash E-PROM" memories. This has the advantage that a non volatile storage can be provided for the screens of video graphics data, whilst still permitting the screens of video data to be updated as required.

Preferably, the programmable means comprises a video switch having a first video input connected, in use, to receive the video signals output by the machine controller, a second video input connected, in use, to receive video signals from the solid state memory means, a video output connected, in use, to the video display device and a control input connected, in use, to receive control signals generated by the control logic for selecting the connection of the first, or the second video input to the video output. Preferably, the programmable means also comprises program storage for storage of the control logic and a microcontroller under control of the control logic.

In the preferred embodiment, the control logic repeatedly interrupts the video signals from the machine controller in a first mode of operation thereof, the control logic causing the display of one screen of video data per interruption but cycling the screen of video data displayed for successive interruptions, the control logic  
5 permitting the display of the video signals from the machine controller for a predetermined period between interruptions.

The video graphics generator preferably comprises means for sensing the operational state of a payment mechanism and/or of user-  
10 operable controls and/or of indicator lights and/or of an audio output as an indication of a change of mode of operation of the video system. In the case of a change from the first to the second mode of operation, the control logic causes control to be returned to the amusement machine controller.

15 As mentioned earlier, the video graphics generator is preferably in the form of an add-on unit for an existing video system, the video graphics generator comprising a first connection means for connecting the unit to the video output of the machine controller, a second connection means for connecting the unit to the video system's video  
20 display device and additional connection means for sensing the operating mode of the video system.

This allows the video graphics generator of this invention to be added to the large stock of existing video system already in the field. Furthermore, it is important that the video graphics generator should  
25 not adversely affect the reliability of the system to which it is added. The above features serve to isolate the video graphics generator from the rest of the video system to an advantageous extent.

The video graphics generator can additionally be provided with means for substituting alternative audio signals for the audio signals  
30 normally output by the video system during said interval in the first mode.

In accordance with the second aspect of the present invention there is provided a video graphics generator system for a video system, the video graphics generator system comprising a video graphics  
35 generator as defined above and a portable programming device for programming into the video graphics generator, a plurality of screens of video graphics data for generating the alternative video signals, the video graphics generator and the portable programming device being

provided with mutually cooperating transmission means for permitting the transfer of data from the portable programming device to the video graphics generator.

The invention also provides a video system operable in a first, inactive, mode and a second, active mode, the video system comprising a video display device, user operable activation means, a machine controller operable in both the first mode and, in response to activation of the activation means, the second mode to output video signals for driving the display device and a video graphics generator as defined above.

A particular embodiment of the invention will be described hereinafter with reference to the accompanying drawings in which: Figure 1 is a schematic diagram of an amusement machine incorporating a video graphics generator;

Figure 2 is a schematic block diagram of the video graphics generator of Figure 1;

Figure 3 is a flow diagram illustrating the operation of control logic for the video graphics generator of Figure 2.

Figure 1 is a schematic diagram of an amusement machine 10 to which a video graphics generator 30 has been added. The conventional amusement machine comprises a housing 12 with, accessible to a user externally to the machine, a coin, token, or other payment mechanism 14 and various game controls 16, which can include one or more of the following: switches, levers, joysticks, trackballs and the like. A machine controller 20 is connected to the payment mechanism 14 and to the user operable controls 16 by control connections 22 and 23, respectively. Each of the connections 22 and 23 can comprise one or more lines as appropriate. At least one output from the machine controller 20 is in the form of a video signal which is passed via a video connection 26 to a video display device 18 (eg. a cathode ray tube with associated circuitry). Also shown is a connection 24 from the machine controller 20 to an indicator light 17. It will be appreciated that a typical amusement machine has many such indicator lights, although these are not shown here for reason of clarity. Other connections, to further indicator or control lights and to an audio system, for example, can be provided. In addition, a power supply, normally connected to a mains electricity supply, and appropriate wiring will be provided. These additional elements, which can be

conventional, are not shown for reasons of clarity.

The video graphics generator 30 is a feature not present in conventional video based amusement machines. The video graphics generator 30 is inserted in the video connection 26 between the machine controller and the video display device 18. Thus, a first connection 26A connects the video output of the machine controller to a video input of the video graphics generator 30. A second connection 26B connects the video graphics generator to the cathode ray tube 18. In addition, the video graphics generator is provided with control connections 32 for sensing the operation of various elements of the amusement machine 10. In the example shown, the control connections 32 sense the operating states of the payment mechanism 14, the game controls 16 and the indicator light 17. These control connections 32 are not present in a conventional amusement machine.

Figure 2 is a schematic block diagram of a video graphics generator 30. The video graphics generator 30 is microcontroller based. A microcontroller 34 is connected to a number of other system units via a computer bus 36. Connected to the microcontroller 34 via this bus 36 are a read only program memory 38 for the storage of control programs, an E-PROM (erasable programmable read only memory) array 40 (e.g. of flash E-PROM memory chips) forming a picture memory for the storage of a plurality of screens of video graphics data, a video controller 42 for controlling the reading of graphics data from, and the writing of graphics data to the picture memory 40, an RGB palette DAC (digital to analogue converter) 44 and an external programmer connector 52. The microcontroller 34 contains its own internal working random access memory (RAM). However, provision is made for the optional addition of extra RAM 50 to the computer bus 36. The data output from the array of E-PROMs 40 is connected to the RGB palette DAC 44, which converts the digital graphics data from the picture memory into colour signals. The output of the RGB palette DAC 44 is connected to one input, G, of a video switch 46 via a video connector line 48. The video output of the machine controller 20 is connected via the video connection 26A to the second input A of the video switch 46. The output O of the video switch 46 is connected to the video connection 26B to the cathode ray tube 18. The video switch is connected via control lines 49 to the microcontroller 34. In order to that the video graphics generator should not adversely affect the

reliability of the amusement machine, the video switch 46 is arranged to have a default state in which the video output of the machine controller 20 is passed to the cathode ray tube 18. Thus, if the video graphics generator fails, then the amusement machine still operates.

5       The microcontroller 34 is linked via an opto-isolator 54 to the control connections 32 for sensing the operational state of the payment mechanism 14, the game controls 16 and the indicator lights 17 of the amusement machine. The microcontroller 34 has a selection of different types of detection circuitry for use with different sensing schemes.  
10       For example, if a simple 'insert money' light is being monitored then a logic gate will be sufficient, but if an attract mode audio signal is being monitored then an integrator would need to be inserted in front of a logic gate to provide a binary indication of whether or not audio output signals are being generated.

15       Also shown in Figure 2 is external interface circuitry 56 which can be used for reprogramming the microcontroller 34 via an external serial port 58.

      The programmer 52 is used for connecting a programmer device (not shown) for programming the picture memory 42, which, as mentioned  
20       above, is used to hold a plurality of screens of graphics data. In the preferred embodiment eight screens are stored. When it is intended to programme the picture memory, an E-PROM programmer device (not shown) is plugged into the programmer connector 52. In the present embodiment of the invention the programmer connector 52 is an electrical socket,  
25       the programmer having a co-operating plug. However, the socket could be provided on the programmer device and the plug on the video graphics generator 30. An optical link could alternatively be provided in other embodiments. On insertion of the plug of the programmer device into the socket 52, the microcontroller senses that the video graphics  
30       generator is to be programmed. This causes the microcontroller to activate a programming mode, and, in a conventional manner, data can then be loaded from the portable programming device into the E-PROM array 42 under the control of the video controller 42. The video graphics data for respective screens are stored at respective sets of  
35       locations within the E-PROMs 42. The microcontroller maintains a pointer to a current video graphics screen for display. This operation, which is conventional in nature, is not described further herein. On completion of the programming operation, the programming



device is disconnected from the video graphics generator 30.

Figure 3 illustrates the operation of the video graphics generator under control of control logic stored in the ROM 38. The amusement machine 10 is operable in two different modes. The default mode, or attract mode, is one in which the machine controller of the amusement machine generates video information for display on the cathode ray tube 18 which is intended to attract a customer to use the amusement machine 10. In a second, play mode, which is operable after actuation of the payment mechanism 14, the user is able to use the user operable means 16 to interact with programs in the machine controller 20 to play a game.

The purpose of the video graphics generator is to interrupt the attract mode for the display of alternative video data in the form of graphics screens whilst ensuring that the play mode is not interrupted. The alternative graphics screens can take the form of advertisements for products or services. Figure 3 illustrates the operation of control logic of the video graphics generator 30, the control logic being stored in the ROM 38.

The control logic 60 tests whether a play mode has been activated by sensing signals on the control connections 32. This test is made repeatedly until the play mode ceases as detected by control signals on the control connections 32. When the play mode ceases, the amusement machine reverts to the default, or attract mode. On detecting this, the control logic 62 sets a first timer, TG, and a second timer, TA. The control logic 64 then causes the video switch to connect input G to output 0. A current screen of video graphics data can then be passed via the connection 48 via the video switch 46 and the video connection 26B to the video display device 18. The screen of video graphics data to be displayed is determined by addresses supplied via the bus 36 using the pointer maintained by the microcontroller 34.

If the control logic 66 detects that a play mode has been reselected (e.g. by operation of the payment mechanism 14), the control logic 68 switches the video switch back so that the input A is connected to the output 0. At this point, the screen of graphics data from the picture memory 40 ceases to be displayed, being replaced by the output from the machine controller 20. If, the control logic 66 does not detect that the play mode has been activated, the control logic 70 decrements the timer TG and then the control logic 72 tests

whether the timer TG has timed out. If the control logic 72 determines that the timer TG has not counted out yet, then control reverts to the control logic 66. If the control logic 72 determines that the timer TG has timed, or counted out, this indicates that the current screen or video graphics data has been displayed for the desired length of time. In this case, the control logic 74 resets the timer TG and causes the pointer to the current graphics screen to be updated to point to the next graphics screen within the picture memory 40. The control logic 74 operates in such a manner that the video graphics generator cycles repeatedly through the screens of video graphics data stored therein. The control logic 74 then causes the video switch to switch the input A to the output 0 causing the display of data from the machine controller 20 on the video connection 26A to be displayed on the video display device 18 via the video connection 26B. The control logic 76 then tests whether the play mode has been activated. If the play mode has been activated, control returns to the control logic 60. If play mode has not been activated, however, the control logic 78 decrements the timer TA and then the control logic 80 tests whether the timer TA has counted out. If the timer TA has not counted out, then control returns to the control logic 76. If the control logic 80 determines that the timer TA has counted out, indicating that the attract mode has been displayed for a desired period, then the control logic 82 resets timer TA and control passes back to the control logic 64. Thus, it can be seen that the timers TG and TA, which are preferably implemented as counters, enable different periods to be set for the display of the video graphics screens, and the attract mode, respectively by setting appropriate initial counts in the respective counters.

The preferred embodiment of the invention is in the form of an add-on unit for an existing amusement machine. Accordingly, it is provided in a housing, (not shown), having attachment means (not shown) for attaching the video graphics generator at an appropriate position within the amusement machine. The control connections 32 required in any specific embodiment, will depend on the specific amusement machine for which the video graphics generator is intended. These connections are to appropriate positions within the amusement machine to test the operational state of the machine. The video graphics generator is ideally provided with connectors plugs and/or sockets for providing easy connection of the video graphics generator into the video

connection 26. Easy access to the connector 52 for programming the picture memory 40 by means of a portable programming device can be provided. Ideally this is arranged by situating the video graphics generator at a position within the amusement machine, close to the payment mechanism. Then, a service engineer, when visiting to empty the payment mechanism of any coins, can re-program the picture memory 40. Although a specific embodiment of the invention has been described, it will be appreciated that many additions and modifications are possible. For example, although in the preferred embodiment, the video graphics generator is provided as an add-on unit for an existing amusement machine, it could be incorporated as an integral component in a new amusement machine.

Although, in the present embodiment a flash E-PROM is used for the storage of the screens of video graphics data, other sorts of re-programmable memory could be used. For example, a conventional RAM could be used, although in this case a battery back-up would be desirable to avoid the screens of video graphics data being erased if the power supply is interrupted.

With the provision of a more complicated video switch, the alternative video graphic images could be displayed over a part of the screens from the attract mode, rather than replacing them altogether. Alternatively, a plurality of screens of graphics data could be displayed on each interruption of the attract mode, the plurality of screens being shown one after the other or simultaneously (e.g. at different screen positions).

The video graphics generator could additionally be provided with means for interrupting the audio output of the amusement machine. Thus, in the case of an advertisement, when a video graphics screen is displayed on the display device, this could be accompanied by the playing of a current jingle used in a corresponding television advertising campaign.

CLAIMS

1. A video graphics generator for a video system which is operable in a first, inactive, mode and a second, active, mode and which includes a video display device, user operable activation means and a machine controller operable in both the first mode and, in response to activation of the activation means, in the second mode to output video signals for driving the display device, the video graphics generator comprising programmable means responsive to operation of the video system in the first mode to interrupt the video signals output by the machine controller for a predetermined interval and to substitute alternative video signals for display on the video display device during the interval.
2. A video graphics generator as claimed in Claim 1, wherein the video system is an amusement machine, the first mode is an attract mode, the second mode is a play mode and the activation means is a play select means.
3. A video graphics generator as claimed in any one of Claims 1 or 2, wherein the programmable means comprises solid state memory for the storage of a plurality of screens of videos graphics data, and control logic for selecting a screen of video graphics data from storage for generating the alternative video signals for display.
4. A video graphics generator as claimed in Claim 3 wherein the solid state memory means comprises one or more E-PROM memories.
5. A video graphics generator as claimed in any one of Claims 3 or 4, wherein the programmable means comprises a video switch having a first video input connected, in use, to receive the video signals output by the machine controller, a second video input connected, in use, to receive video signals from the solid state memory means, a video output connected, in use, to the video display device and a control input connected, in use, to receive control signals generated by the control logic for selecting the connection of the first, or the second video input to the video output.

6. A video graphics generator as claimed in any one of Claims 3 to 5, wherein the programmable means comprises program storage for storage of the control logic and a microcontroller under the control of the control logic.

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7. A video graphics generator as claimed in any one of Claim 3 to 6 wherein the control logic repeatedly interrupts the video signals from the machine controller in the first mode of operation thereof, the control logic causing the display of a selectable number screens of video data per interruption, by cycling the screen of video data displayed for successive interruptions, the control logic permitting the display of the video signals from the machine controller for a predetermined period between interruptions.

15 8. A video graphics generator as claimed in any one of the preceding claims including means for sensing the operational state of a payment mechanism and/or of user operable controls and/or of indicator lights and/or of an audio output as an indication of a change of mode of operation of the video system.

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9. A video graphics generator as claimed in any one of the preceding claims as an add-on unit for a video system, the video graphics generator comprising a first connection means for connecting the unit to the video output of the machine controller, a second connection means for connecting the unit to the video system's display device and additional connection means for sensing the operating mode of the video system.

10. A video graphics generator as claimed in any preceding claim comprising means for substituting alternative audio signals for the audio signals normally output by the video system during said interval in the first mode.

11. A video graphics generator system for a video system, the video graphics generator system comprising a video graphics generator as claimed in any one of the preceding Claims and a portable programming device for programming into the video graphics generator, a plurality of screens of video graphics data for generating the alternative video

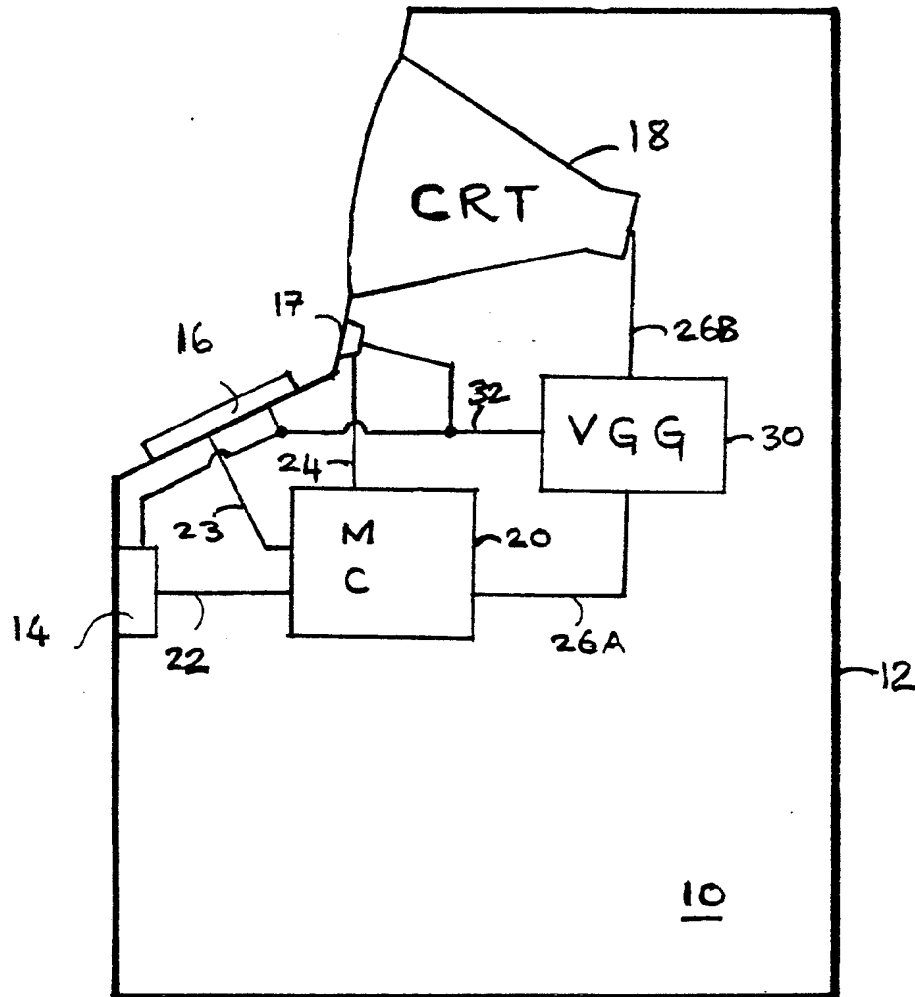
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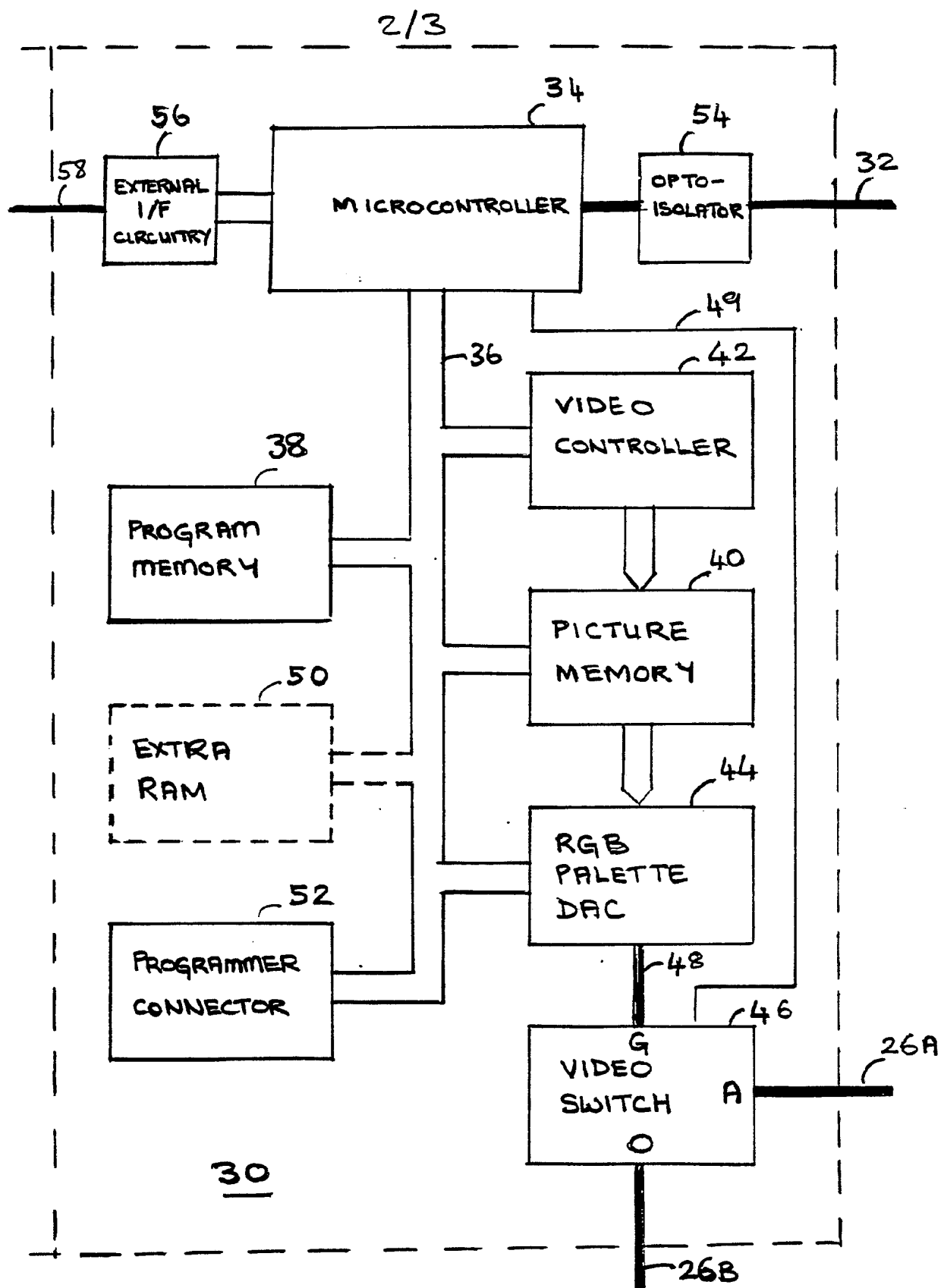
signals, the video graphics generator and the portable programming device being provided with mutually cooperating transmission means for permitting the transfer of data from the portable programming device to the video graphics generator.

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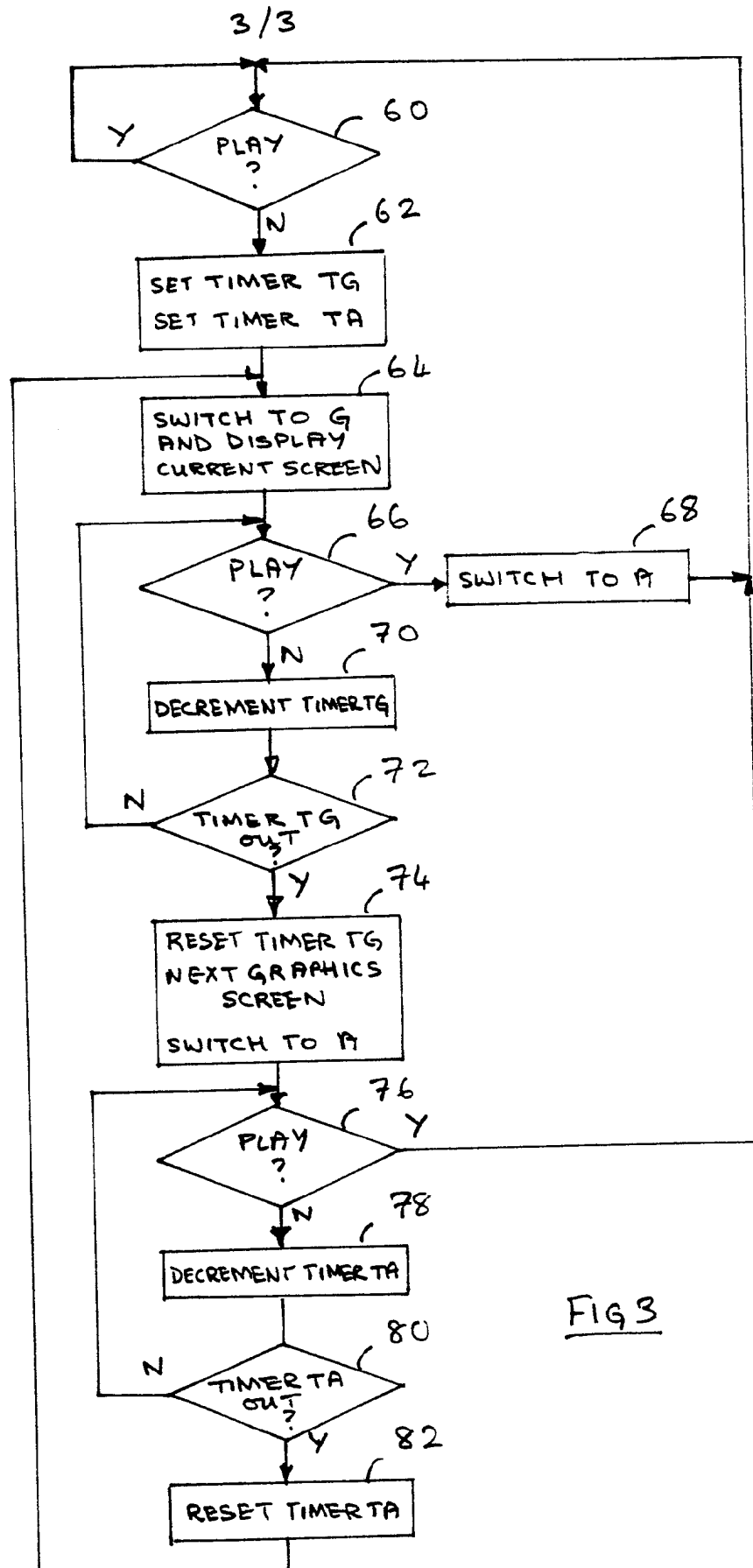
11. A video system operable in a first, inactive, mode and a second, active mode, the video system comprising a video display device, user operable activation means, a machine controller operable in both the first mode and, in response to activation of the activation means, the  
10 second mode to output video signals for driving the display device and a video graphics generator as claimed in any one of Claim 1 to 9.

1/3

FIG 1

FIG 2



FIG 3

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 92/00344

**I. CLASSIFICATION OF SUBJECT MATTER** (if several classification symbols apply, indicate all)<sup>6</sup>

According to International Patent Classification (IPC) or to both National Classification and IPC  
 Int.Cl. 5 A63F9/22

**II. FIELDS SEARCHED**Minimum Documentation Searched<sup>7</sup>

Classification System	Classification Symbols
Int.Cl. 5	A63F9

Documentation Searched other than Minimum Documentation  
 to the Extent that such Documents are Included in the Fields Searched<sup>8</sup>

**III. DOCUMENTS CONSIDERED TO BE RELEVANT<sup>9</sup>**

Category <sup>10</sup>	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
X	GB,A,2 141 907 (M. GILMORE ET AL.) 3 January 1985 see page 1, line 107 - page 2, line 44 see page 2, line 55 - line 63 see page 2, line 83 - line 96 see page 2, line 109 - page 3, line 11	1-6,8, 11,12
A	---	7,9
X	DE,A,3 048 393 (DYNAMICS MARKETING GMBH) 22 July 1982 see page 4, line 1 - page 5, line 5 see page 5, line 35 - page 7, line 32	1-3,7,8, 12
A	---	5,10
X	WO,A,8 203 318 (P. HORAN) 14 October 1982 see page 14, line 16 - line 25 see page 15, line 15 - page 19, line 8	1,2,8,12
A	---	5-7
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**IV. CERTIFICATION**

Date of the Actual Completion of the International Search

24 APRIL 1992

Date of Mailing of this International Search Report

6. 05. 92

International Searching Authority

EUROPEAN PATENT OFFICE

Signature of Authorized Officer

DUHR R.H.J.E.

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
X	GB,A,2 091 069 (COMPUTER FIELD SUPPORT LTD.) 21	1-4,9,12
A	July 1982 see the whole document	7,8
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**ANNEX TO THE INTERNATIONAL SEARCH REPORT  
ON INTERNATIONAL PATENT APPLICATION NO. GB 9200344  
SA 56788**

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.  
The members are as contained in the European Patent Office EDP file on  
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB-A-2141907	03-01-85	None	
DE-A-3048393	22-07-82	None	
WO-A-8203318	14-10-82	EP-A- 0075564 AU-A- 8276482	06-04-83 19-10-82
GB-A-2091069	21-07-82	None	